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Indian Standard

PROCEDURE FOR CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

PART II DRY HEAT TEST

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PROCEDURE FOR CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

PART II DRY HEAT TEST

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Indian Standard

PROCEDURE FOR CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

PART II DRY HEAT TEST

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 21 July 1982, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Fast development in the field of instruments has brought a significant change in their basic content and design. It has been felt over the years that IS : 2352-1963* does not cater for the present day needs of the instruments and is also not in line with the recent trends in climatic and environmental testing procedures to be adopted for improving their quality and reliability. It has, therefore, become necessary to have uniform and more rational testing procedures as far as possible. This series of standards on climatic and durability tests (IS : 10236) has been prepared with this objective.

0.2.1 It is proposed to withdraw the existing Indian Standard (IS : 2352-1963*) as soon as the tests mentioned therein are covered in the new series (IS : 10236).

0.3 This stanadard deals with dry heat tests applicable both for high temperature use and storage, with and without thermal shock.

1. SCOPE

1.1 This standard (Part II) covers the procedure for conducting dry heat test for optical instruments.

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*Procedure for basic climatic and durability tests for optical instruments.

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions given in IS : 10236 (Part I)* shall apply.

3. OBJECT

3.1 The object of the dry heat test is to dertermine the suitability of optical instrument for use and/or storage at high temperature appropriate to the required severity.

4. INITIAL MEASUREMENTS

4.1 The instrument shall be visually examined and optically, electrically and mechanically checked as required by the relevant instrument specification.

5. TEST CHAMBER

5.1 The chamber used for this test shall meet the requirements specified in **5.1.1** to **5.1.8**.

5.1.1 The chamber shall be capable of maintaining its working space at any high temperature as desired by the required severity with a tolerance of ± 3°C.

5.1.2 The relative humidity shall not exceed 50 percent.

5.1.3 The temperature in the chamber shall be monitored by a temperature sensing device suitably located in its working space.

5.1.4 The air in the chamber shall be continuously agitated but not vigorously. Necessary care shall be taken to ensure that the conditions throughout the chamber are homogeneous and are as near as possible to those prevailing in the immediate vicinity of the sensing device.

5.1.5 The specimen under test shall not be subjected to direct radiation from the heating element of the chamber.

5.1.6 Care shall be taken that any heat dissipation of the specimen under test shall not appreciably influence the conditions in the chamber.

5.1.7 The chamber shall have provision to supply electric power to the specimen under test from an external source.

5.1.8 The chamber shall have a provision for a suitable viewing window to see the functioning of the instrument, as and when required.

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*Procedure for climatic and durability tests for optical instruments : Part I General (*under preparation*).

6. TEST SEVERITIES

6.1 The severity indicated by temperature shall be as specified in the relevant instrument specification. The value may be selected from those given below:

100°C ± 3°C
85°C ± 3°C
70°C ± 3°C
55°C ± 3°C
40°C ± 3°C

7. TEST PROCEDURE

7.1 Method I — Test without thermal shock for high temperature use.

7.1.1 The instrument shall be subjected to this test in the unpacked condition.

7.1.2 At the laboratory temperature the instrument under test shall be introduced into the chamber. The temperature of the chamber shall then be raised to the severity as specified in relevant instrument specification, at a rate not exceeding 5°C per 5 minutes.

7.1.3 On attaining the temperature equilibrium, if required by the relevant instrument specification, the electrical/electronic arrangement, if fitted in the instrument, shall be switched on to check whether it is functioning or not. After this verification the arrangement shall be switched off.

7.1.4 After attaining the temperature equilibrium the instrument shall remain at the temperature appropriate to the severity for 16 hours or such other period as may be specified in the relevant instrument specification.

7.1.5 At the end of the period of exposure, if required by the relevant instrument specification the electrical/electronic arrangement fitted in the instrument shall be switched on and its functioning seen.

7.1.6 At the end of the test, the chamber shall be switched off and allowed to cool down to the temperature as specified in the standard atmospheric conditions for recovery.

7.1.7 *Recovery* — The instrument shall then be removed from the chamber and kept under standard atmospheric conditions for recovery for not less than one hour nor more than two hours.

7.2 Method II — Test without thermal shock for high temperature storage.

7.2.1 The instrument shall be subjected to this test in the unpacked condition.

7.2.2 At the laboratory temperature the instrument under test shall be introduced into the chamber. The temperature of the chamber shall then be raised to the severity as specified in the relevant instrument specification, at a rate not exceeding 5°C per 5 minutes.

7.2.3 After temperature equilibrium has been attained the instrument shall remain at the high temperature appropriate to the severity for 96 hours or such other period as may be specified in the relevant instrument specification.

7.2.4 After that period the chamber shall be switched off and allowed to cool to the temperature as specified in the standard atmospheric conditions for recovery.

7.2.5 *Recovery* — The instrument shall then be removed from the chamber and kept under standard atmospheric conditions for recovery for not less than one hour nor more than two hours.

7.3 Method III — Test with thermal shock for high temperature use.

7.3.1 The instrument shall be subjected to this test in the unpacked condition.

7.3.2 At the laboratory temperature the instrument shall be introduced into the chamber which is maintained at the severity required by the relevant instrument specification.

7.3.3 On attaining the temperature equilibrium, if required by the relevant instrument specification, the electrical/electronic arrangement, if fitted in the instrument, shall be switched on to check whether it is functioning or not. After this verification the arrangement shall be switched off.

7.3.4 After attaining the temperature equilibrium the instrument shall remain at the temperature appropriate to the severity for 16 hours or such other period as may be specified in the relevant instrument specification.

7.3.5 At the end of the period of exposure, if required by the relevant instrument specification, the electrical/electronic arrangement fitted in the instrument shall be switched on and its functioning seen.

7.3.6 The instrument shall then be removed from the chamber and as required by the relevant instrument specification, its moving parts shall be examined at a temperature near to the specified severity. Signs of any flow of lubricant at the movable joints shall be carefully observed, particularly in instruments required for use by Defence Services.

7.3.7 *Recovery* — After the above examination, the instrument shall remain under standard atmospheric conditions for recovery for a period not less than one hour nor more than two hours.

7.4 Method IV — Test with thermal shock for high temperature storage.

7.4.1 The instrument shall be subjected to this test in the unpacked condition.

7.4.2 At the laboratory temperature the instrument shall be introduced into the chamber which is maintained at the severity required by the relevant instrument specification.

7.4.3 After temperature equilibrium has been attained the instrument shall remain at the high temperature appropriate to the severity for 96 hours or such other period as may be specified in the relevant instrument specification.

7.4.4 *Recovery* — After that period the instrument shall be taken out of the chamber and kept at standard atmospheric conditions for recovery for not less than one hour nor more than two hours.

8. FINAL MEASUREMENTS

8.1 After recovery the instrument shall be visually examined and tested for its performance in accordance with the relevant instrument specification and in the case of tropicalized instruments also for leaks.

9. DETAILS TO BE GIVEN IN RELEVANT INSTRUMENT SPECIFICATION

9.1 When this test is included in the relevant instrument specification, the following details shall be given as far as they are applicable:

a) Initial observations/measurements;

b) Temperature severity;

c) Method/methods to be adopted;

d) Duration of conditioning if other than specified;

e) Functional tests to be carried out for electrical/electronic arrangement during conditioning, if so required;

f) Whether mechanical movements to be observed at high temperature;

g) Duration of recovery if other than specified;

h) Final observations/measurements; and

j) Any deviation from the normal procedure.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb m
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1}),
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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